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PATENT ABSTRACTS OF JAPAN

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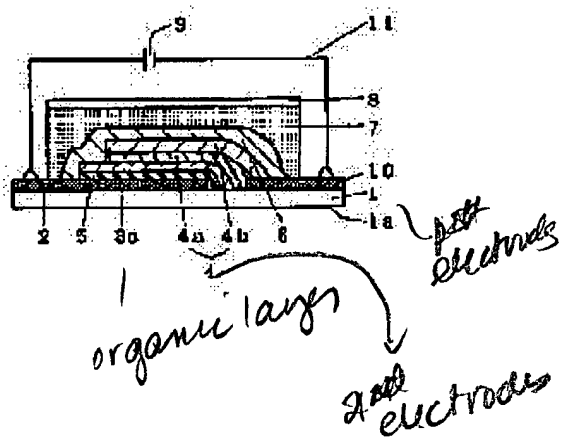
(71)Applicant : **TOPPAN PRINTING CO LTD**
(72)Inventor : **ITO YUICHI**

(54) THIN-FILM ELECTROLUMINESCENT ELEMENT

(57)Abstract:
PURPOSE: To provide an electroluminescent element which is easy to see even in a well-lighted room by reducing the external light reflectivity of the electroluminescent element.
CONSTITUTION: In this thin-film electroluminescent element which has an emitter layer 3o that is made to emit light by application of a current and located between a translucent electrode 2 and a back electrode 4 which are opposite to each other, the back electrode 4 comprises a light-absorbing electrode layer 4a and a conductive auxiliary electrode layer 4b. The light absorbing electrode layer 4a is disposed on the side of the emitter layer 3.



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CLAIMS

[Claim(s)]
[Claim 1] The thin film type EL element characterized by for this back plate consisting of an extinction nature electrode layer and an electric conduction auxiliary-electrode layer, and allotting the extinction nature electrode layer to the luminous layer side between the translucency electrodes and back plates which counter mutually in the thin film type EL element which has the luminous layer which emits light by impression of current.
[Claim 2] The thin film type EL element according to claim 1 in which an extinction nature electrode layer contains a metallic oxide or a metal nitrogen object.
[Claim 3] The thin film type EL element according to claim 1 or 2 by which the metal is doped by the surface-layer field by the side of the luminous layer of an extinction nature electrode layer.
[Claim 4] The thin film type EL element according to claim 1 to 3 to which this back plate is characterized by having further the electron-injection low work function layer of a low work function rather than the work function of an extinction nature electrode layer in the luminous layer side of an extinction nature electrode layer.
[Claim 5] The thin film type EL element according to claim 1 to 4 whose light absorptivity of an extinction nature electrode layer is at least 50%.
[Claim 6] The thin film type EL element according to claim 1 to 4 whose thickness of an extinction nature electrode layer an electron-injection low work function layer is a translucent mirror-like, an electric conduction auxiliary-electrode layer is a mirror-like, and the light absorptivity of an extinction nature electrode layer is 90% or less, and is one half of the integral multiples of the luminescence dominant wavelength of a luminous layer.
[Claim 7] The thin film type EL element according to claim 1 to 6 which is the organic luminous layer which a luminous layer turns into from an organic fluorescent substance and by which the hole-injection transporting bed is formed between the translucency electrode and the luminous layer.
[Claim 8] The thin film type EL element according to claim 1 to 6 which is the inorganic luminous layer which a luminous layer turns into from an inorganic semiconductor.
[Claim 9] The thin film type EL element according to claim 1 to 6 by which a luminous layer is an inorganic luminous layer which consists of an inorganic fluorescent substance, and the inorganic luminous layer is pinched by the insulating layer.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the thin film type EL element using the emitter thin film which consists of a fluorescent substance organic [still more detailed] or inorganic etc. as a luminous layer about the light emitting device (it abbreviates to an EL element hereafter) using the electro RUMINESU sense phenomenon.
[0002]
[Description of the Prior Art] The conventional EL element can be divided into the thing of distributed type [the point of the formation technique of a luminous layer], and a thin film type thing. In the case of a distributed EL element, a luminous layer forms by the coating method etc. what distributed the inorganic fluorescent substance particle to the resin binder. On the other hand, in the case of a thin film type EL element, a luminous layer forms membranes by the vacuum deposition, the spatter, etc. Among these, since the direction of the latter thin film type EL element is excellent in the threshold property, it has the property of being easy to process it into the display of an X-Y-matrix drive.
[0003] Although such a thin film type EL element can be divided into an alternating current drive type thing and a direct-current drive type thing at the point of drive current, fundamentally, it has the laminated structure by which the organic or inorganic luminous layer was pinched between the translucency electrode (usually anode plate) and the back plate (usually cathode) in both cases. And in the case of the alternating current drive type EL element, the insulating layer is further arranged to both sides of a luminous layer.
[0004] In such a thin film type EL element, peripheral devices, such as a boosting transformer, have an unnecessary direct-current drive type thin film EL element, and the miniaturization attracts attention from eye a possible hatchet as the whole element. The organic thin film type EL element which has the organic luminous layer which consists of an organic fluorescent substance etc. as a direct-current drive type thin film EL element, and the inorganic field luminescence type thin film type EL element which has the inorganic luminous layer which consists of an inorganic semiconductor are known.
[0005] Here, an organic thin film type EL element is developed by C.W.Tang and others of Eastman Kodak Co., and the structure is shown in drawing 6 . That is, as mentioned above, the translucency substrate 1, the translucency electrode (usually anode plate) 2, organic luminous layer 3o, and the back plate (usually cathode) 4 have the structure which carried out the laminating, and it has further the structure where the hole-injection transporting bed 5 was formed between the translucency electrode 2 and organic luminous layer 3o (JP,2-15595,A, JP,4-212287,A, etc.).
[0006] Moreover, as a field luminescence type direct-current drive type inorganic thin film type EL element which used the inorganic semiconductor as a luminous layer, as shown in drawing 7 , what constituted luminous layer 3i from alpha-p type SiC layer 3a, alpha-i type SiC layer 3b, and alpha-n type SiC layer 3c is known, for example, (the functional-material February issue, p27 (1988)). In this case, the hole-injection transporting bed is not formed.
[0007] By the way, a these direct-current drive type thin film type EL element is begun, and transparent electrodes which generally formed Au etc. thinly, such as a translucent electrode and a multiple oxide (ITO) of In and Sn, are used as a translucency electrode 2 in the above-mentioned alternating current drive type thin film type EL element. On the other hand, as a back plate 4, in order to raise the adhesion to the vacuum evaporationo film and the organic films of a simple substance metallic material, such as calcium, Mg, aluminum, and In, the coevaporation membrane of such a simple substance metallic material and charges of an alloy, such as Mg:Ag, Ag:Eu, Mg:Cu, Mg:In, Mg:Sn, and aluminum:Li, is used. And generally the light which the luminous layer emitted is taken out from the translucency electrode side.
[0008]
[Problem(s) to be Solved by the Invention] However, since the back plate 4 of a thin film type EL element was formed from the high metallic material or the charge of an alloy of a reflection factor when the conventional thin film type EL element is arranged to two-dimensional and it considers as a display, there was a problem that the outdoor daylight reflection factor of a back plate 4 was high. For this reason, the contrast of the picture under display fell and the picture was hard to see in the bright room.
[0009] Moreover, making a back plate translucent is performed by making into the thickness of about 10nm thickness of the back plate which to take out light from a back plate (generally cathode) side is also tried, and it becomes from a metal or the charge of an alloy in that case. In this case, since the outdoor daylight reflection factor of a back plate becomes low, it can make high contrast of the picture when seeing from a translucency electrode side by arranging black sheet-like material, such as carbon and a vacuum evaporationo thin film of buckminsterfullerene, on the back plate front face of a luminous layer and an opposite side.

[0010] However, since a back plate became thin, the electric resistance increased, and there was a problem of being easy to corrode a back plate. Moreover, when the vacuum evaporationo thin film of carbon or buckminsterfullerene was used as a black sheet-like material, there were also a problem that picture quality deteriorates since these films tend to become that it is not black and brown, and membranous intensity and the problem of being weak again.
[0011] without solving the technical problem of the above-mentioned conventional technology, and increasing the electric resistance of a back plate, this invention reduces the outdoor daylight reflection factor of the back plate of a thin film type EL element, and offers the thin film type EL element which can form the picture of high contrast -- it aims at things
[0012]
[Means for Solving the Problem] By constituting from an extinction nature electrode layer which consists the back plate of a thin film type EL element of a conductive material of extinction nature, and an electric conduction auxiliary-electrode layer with which the conductivity of the extinction nature electrode layer is compensated, this invention person finds out that the above-mentioned purpose can be attained, and came to complete this invention.
[0013] That is, in the thin film type EL element which has the luminous layer which emits light by impression of current between the translucency electrodes and back plates which counter mutually, this back plate consists of an extinction nature electrode layer and an electric conduction auxiliary-electrode layer, and this invention offers the thin film type EL element characterized by allotting the extinction nature electrode layer to the luminous layer side.
[0014] Hereafter, the thin film type EL element of this invention is explained, referring to a drawing. In addition, in the drawing, the same sign shows the same or equivalent component.
[0015] Drawing 1 , drawing 2 , and drawing 3 are the cross sections of the organic direct-current drive type thin film type EL element which has the organic luminous layer which consists of an organic fluorescent substance, and drawing 4 is the cross section of the inorganic direct-current drive type thin film type EL element which used the light emitting diode thin film as an inorganic luminous layer, and drawing 5 is the cross section of the inorganic alternating current drive type thin film type EL element which has the inorganic luminous layer which consists of an inorganic fluorescent substance.
[0016] First, it explains from the organic thin film type EL element of drawing 1 . As shown in this drawing, this EL element has the structure where the translucency substrate 1, the translucency electrode (usually anode plate) 2, the hole-injection transporting bed 5, organic luminous layer 3o, the back plate (usually cathode) 4, the closure layer 6, the adhesion material layer 7, and the closure board 8 were arranged one by one.
[0017] In the organic thin film type EL element of this invention of drawing 1 , a back plate 4 is constituted from extinction nature electrode layer 4a and electric conduction auxiliary-electrode layer 4b, and it is characterized by allotting the extinction nature electrode layer 4a to the organic luminous layer 3o side. Thus, the outdoor daylight reflection factor of a back plate 4 can be reduced by using extinction nature electrode layer 4a for a part of back plate 4.
[0018] Moreover, although the electrical conducting material of extinction nature is used in order to form extinction nature electrode layer 4a, since such an electrical conducting material has inadequate conductivity, it needs to compensate the conductivity. Therefore, in this invention, electric conduction auxiliary-electrode layer 4b is formed in the closure layer 6 side of extinction nature electrode layer 4a. Thereby, the outdoor daylight reflection factor of a back plate 4 can be reduced, without increasing the electric resistance of a back plate 4.
[0019] Here, as a material which constitutes extinction nature electrode layer 4a, rather than a stoichiometric composition, there are many metaled rates, they are independent in a few black metallic-oxide metallurgy group nitride, or can compound and use it. For example, the multiple oxide of MgO 1-x, In 2O3-x, GaO 1-x, TeO 2-x, Ta 2O5-x, GaN 1-x (x> 0), NiO 1+x (x= about 0.2), and Fe and Mn etc. can be illustrated.
[0020] In order to reduce effectively the outdoor daylight reflection factor of a back plate 4, as for the thickness of extinction nature electrode layer 4a, it is desirable to consider as thickness from which the optical absorption of the whole visible-ray field (400nm - 800nm) becomes 50% or more, and although it changes with kinds of usually constituted material etc., it is taken as the thickness which is about 30-300nm. Thereby, the outdoor daylight reflection factor at the time of measuring with the incident angle of 5 times can be made 50% or less.
[0021] In addition, in the case of the mode of drawing 1 , formation of extinction nature electrode layer 4a can be performed by controlling conditions, such as an evaporation rate, a degree of vacuum, and gas atmosphere, in the well-known way, for example, CVD, the organic film which constitutes organic luminous layer 3o etc. does not receive a damage.
[0022] It is desirable to use thickness required in order to compensate metals, such as a conductive good metal, for example, Mg, aluminum, In, Cu, Ag, Au, etc., with the conductivity of extinction nature electrode layer 4a as electric conduction auxiliary-electrode layer 4b, and the thing which usually carried out the laminating to the thickness of 50-300nm. These can be formed by well-known methods, such as a vacuum deposition and a spatter. However, it is desirable as a component of electric conduction auxiliary-electrode layer 4b not to use alkali metal for a corrosion prevention.
[0023] In addition, it is preferably desirable the surface-layer field by the side of organic luminous layer 3o of extinction nature electrode layer 4a and to dope metals, such as Ag, Cu, and Cr, by methods, such as ********, to the surface-layer field to a depth of about 20nm in order to raise the adhesion to organic luminous layer 3o of extinction nature electrode layer 4a of a back plate 4.
[0024] Moreover, in order to gather the electron-injection efficiency to organic luminous layer 3o, as shown in drawing 2 , it is desirable to prepare electron-injection low work function layer 4c of about [monoatomic layer -20nm] thickness on extinction nature electrode layer 4a by the side of organic luminous layer 3o, and to make a back plate 4 into a three-tiered structure. As such electron-injection low work function layer 4c, since conductivity is secured by electric conduction auxiliary-electrode layer

4b, conductivity about electric conduction auxiliary-electrode layer 4b and equivalent is not needed, but the material which has the resistivity to about 1M omega/** can be used. As such a material, work functions, such as BaO, BaS, CaO, TiSi, WSi, TiN, ZrN and LaB6, a ReTi alloy, and Eu, Mg, Li, can use the alloy of a compound 4.0eV or less or metals, those composites or them, and the metal of 4.0eV or more of work functions, such as aluminum, Ag, and Au, etc.

[0025] As for the thickness of electron-injection low work function layer 4c, it is desirable to consider as the thickness of several nm or less, and the formation can be performed by the well-known method, for example, a vacuum deposition method etc.

[0026] In addition, although it is effective to reduce the outdoor daylight reflection factor of a back plate 4 as mentioned above in order to form the picture of high contrast, it is also effective to make high the reflection factor in the back plate 4 of the light which organic luminous layer 3o emits, especially the light of the dominant wavelength. For that, it is desirable to make electron-injection low work function layer 4c into the shape of a translucent mirror, to make electric conduction auxiliary-electrode layer 4b into the shape of a mirror, to make preferably the light absorptivity of extinction nature electrode layer 4a into 40 - 90% 90% or less, and to consider as 1/2 of the integral multiples of the dominant wavelength of the light in which organic luminous layer 3o emits the optical thickness of extinction nature electrode layer 4a moreover. The phase of light which this reflected among the light which the luminous layer emitted on the electron-injection low work function layer 4c front face, and the phase of light reflected on the front face of electric conduction auxiliary-electrode layer 4b are made in agreement, and the optical intensity of the dominant wavelength can be strengthened. In the case of the light (for example, outdoor daylight) of wavelength different on the other hand from the light which organic luminous layer 3o emitted, a phase shifts. Therefore, the reflection factor in the back plate 4 of the light which organic luminous layer 3o emitted by the interferential action of such a light can be raised relatively, and, on the other hand, the reflection factor of other wavelength can be reduced relatively.

[0027] What is necessary is here, just to form more preferably 20nm or less of the thickness to about 10nm, in order to make into the shape of a translucent mirror electron-injection low work function layer 4c which consists of a metal etc. Moreover, what is necessary is just to form more preferably 40nm or more of the thickness to about 100nm, in order to make electric conduction auxiliary-electrode layer 4b into the shape of a mirror.

[0028] In addition, when raising the reflection factor in the back plate 4 of the light which organic luminous layer 3o emitted using such optical interferential action, the rate of an optical absorption of the extinction nature electrode layer 4a itself may be low. Therefore, as extinction nature electrode layer 4a, transparent electric conduction films other than the component of the extinction nature electrode layer mentioned above, such as ITO and ZnO:aluminum, can also be used.

[0029] In the thin film type EL element of this invention, composition of other invention except considering as the structure which mentioned the back plate 4 above can be considered as the same composition as the conventional EL element. It outlines about other components below.

[0030] As a translucency substrate 1, transparent insulating substrates, such as glass and plastic film, can be used.

[0031] In addition, it is desirable to form the film which processes acid-resisting processing of the glass substrate of a CRT tube or a liquid crystal panel, for example, silica coating etc., to outside-surface 1a of the translucency substrate 1, and contains a ZnO film and an organic ultraviolet ray absorbent at it for degradation prevention.

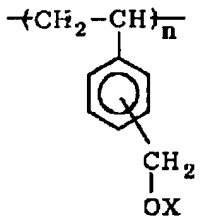
[0032] Usually, the translucency electrode 2 can function as an anode plate, and can be formed from the translucency conductivity matter of 80% or more of visible-ray permeability by 1-100ohms of surface electrical resistance, and ** like the multiple-oxide film which consists of the singular number or two or more elements which were chosen from ITO, ZnO:aluminum, or Ga, germanium, Zn, In and Sn. Moreover, the translucency electrode 2 can be formed from conductive polymers, such as gold, a thin film of platinum, and the poly aniline, polypyrrole, the poly thiophene. Formation of the translucency electrode 2 can be formed by the well-known method according to the electrode material to be used. For example, thin films, such as ITO metallurgy, can be formed by the vacuum deposition method or the spatter. Moreover, in the case of a macromolecule thin film, membranes can be formed by the coating method.

[0033] Moreover, in order to make small the work function difference of the translucency electrode 2 and the hole-injection transporting bed 5 and to raise hole-injection efficiency, you may carry out the laminating of platinum or the palladium by the thickness of 5nm or less on the translucency electrode 2. Moreover, when the translucency electrode 2 is constituted from ITO, the laminating of the oxide transparent conductivity matter with a large work function can also be carried out on the translucency electrode 2 rather than it.

[0034] The hole-injection transporting bed 5 is a layer for raising the hole-injection efficiency from the translucency electrode 2 to organic luminous layer 3o, and can be formed as a monolayer or a multilayer-structure object. As a material which can be used for the hole-injection transporting bed 5 Phthalocyanines, such as amorphous silicon carbide and a copper phthalocyanine N and N' - diphenyl-N and N' -- the - screw (3-methylphenyl) -1 and 1' -- the - biphenyl -4 and 4' -- aromatic tertiary amine, such as - diamine (Following TPD and abbreviation), -- Or JP,4-327561,A, JP,5-271652,A, The polymer material shown in the matter mentioned as an electron hole transportation material in JP,5-311163,A, JP,5-310949,A, the Japanese-Patent-Application-No. No. 300885 [four to] specification, the Japanese-Patent-Application-No. No. 126717 [five to] specification, etc. or following formula (1) - (5) can be illustrated.

[0035]

[Formula 1]



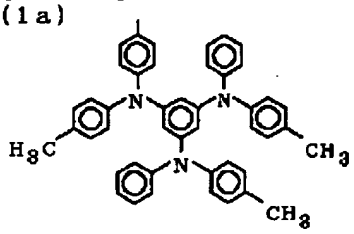
(1)

In a formula (1), n is an integer showing polymerization degree and X is the basis of the following formulas (1a), (1b), or (1c) (1d) electron hole transportability as shown.

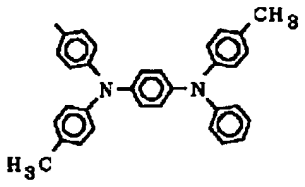
[0036]

[Formula 2]

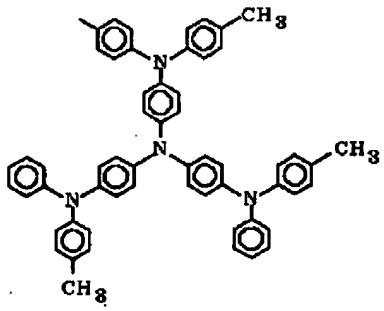
(1a)



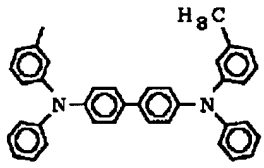
(1b)



(1c)

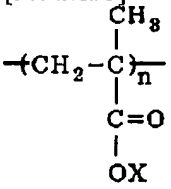


(1d)



[0037]

[Formula 3]

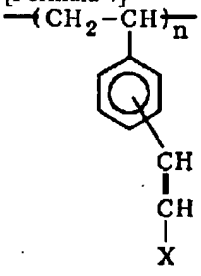


(2)

In a formula (2), n is an integer showing polymerization degree and X is the basis of the same electron hole transportability as a formula (1).

[0038]

[Formula 4]

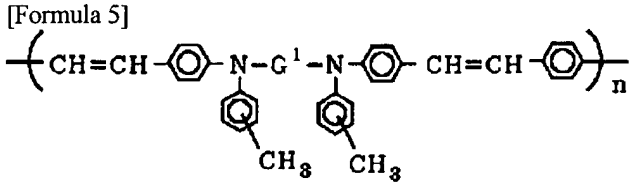


(3)

In a formula (3), n is an integer showing polymerization degree and X is the basis of the same electron hole transportability as a formula (1).

[0039]

[Formula 5]



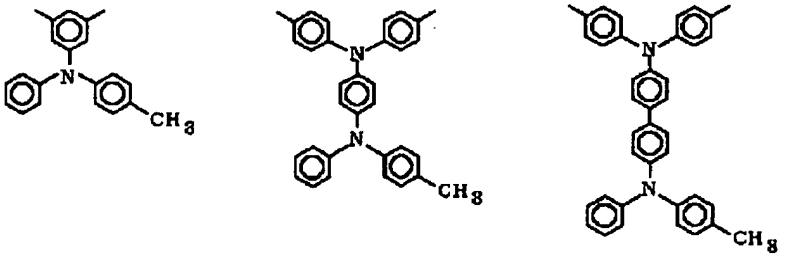
(4)

In a formula (4), n is an integer showing polymerization degree and G1 is the following formulas (4a) or (4b) (4c) a basis containing aromatic tertiary amine as shown.

[0040]

[Formula 6]

(4a) (4b) (4c)



Formation of the hole-injection transporting bed 5 can be performed by methods, such as vacuum deposition, a vacuum evaporationo polymerization, and an application, according to the kind of material to be used. Generally thickness of the hole-injection transporting bed 5 is taken as the thickness of 5-100nm.

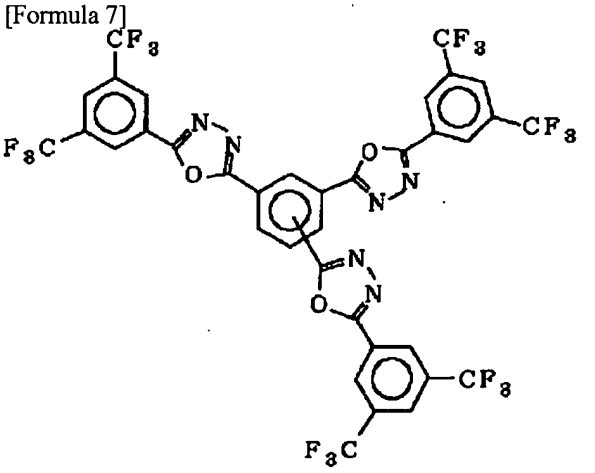
[0041] Organic luminous layer 3o can be formed from a well-known organic fluorescence material. As such an organic fluorescence material, for example Macromolecule fluorescent substances, such as low-molecular fluorescent substances, the poly (Para-phenylenevinylene) derivatives, etc., such as tris (eight quinolinol) aluminum (Following Alq and abbreviation) Or JP,5-271652,A (paragraphs 8-25), JP,5-311163,A (paragraphs 35-39), The luminescent material mentioned as an organic fluorescent substance in the Japanese-Patent-Application-No. No. 300885 [four to] specification (paragraphs 39-46), the Japanese-Patent-Application-No. No. 126717 [five to] specification (paragraphs 52-57), etc. can be illustrated.

[0042] Organic luminous layer 3o is good also as monolayer structure which consists of a kind of an above-mentioned organic fluorescent substance, or two sorts or more, or good also as multilayer structure. Formation of organic luminous layer 3o can be performed by the well-known method, for example, a vacuum deposition. Generally the thickness may be about 5-100nm.

[0043] In addition, you may prepare the layer (not shown) which prevents that raise electron-injection efficiency or an electron hole passes to a back plate 4 between organic luminous layer 3o and a back plate 4. Generally such a layer is called an electron-injection transporting bed, and can be formed from the compound which has the basis of electronic suction nature, such as two or more trifluoromethyl machines or a cyano group, like the compound shown by the formula (5).

[0044]

[Formula 7]



(5)

The closure layer 6 is a layer for preventing degradation and corrosion of organic luminous layer 3o, a back plate 4, etc. Such a closure layer 6 can be formed from sulfides, such as ****** of the oxide of gas and high inorganic compound of steam barrier nature, for example, SiO2, SiO, GeO, MgO, and aluminum 2O3, TiO2, GeO, ZnO and TeO2, Sb2O3, SnO, and B-2O3 grade, MgF2, LiF, BaF2, AlF3 and FeF3, and CaF2 grade, and ZnS, GeS, SnS, etc.

[0045] The closure layer 6 is good also as monolayer structure which consists of a kind of an above-mentioned inorganic compound, or two sorts or more, or good also as multilayer structure. Formation of the closure layer 6 can be performed by the well-known method, for example, a vacuum deposition, the sputtering method, the ion plating method, etc. There is especially no limitation in the thickness, and it can be suitably determined as it if needed.

[0046] Both the adhesion material layer 7 and the closure board 8 are for preventing permeation of moisture and protecting an EL element from external force.

[0047] As an adhesion material layer 7, charges of a binder, such as adhesive resins, such as the resin of low hygroscopicity, for example, photoresist adhesives, epoxy system adhesives, silicone system adhesives, and a bridge formation ethylene-vinylacetate-copolymer adhesives sheet, and a low melting glass, can be used. In this case, you may make the adhesion material layer 7 mix drying agents, such as silica gel and a zeolite.

[0048] As a closure board 8, a glass plate, a metal plate, a plastic sheet, etc. can be used. In order to prevent the invasion of moisture to the interior of an element, you may form drying-agent layers, such as silica gel and a zeolite, in the inside of the closure board 8. Moreover, you may form the layer of getter material which benefits antioxidizing of cathode from alkali metal, alkaline earth metal, rare earth, etc.

[0049] Drawing 1 constituted as mentioned above or the organic thin film EL element of drawing 2 connects a power supply 9, the translucency electrode 2 as an anode plate, and the back plate 4 as cathode with lead wire 11 through cathode output port 10, and emits light by impressing direct current voltage.

[0050] In addition, light is emitted, while voltage impression of the electrode by the side of the hole-injection transporting bed 5 is just carried out, when alternating voltage is impressed.

[0051] What is necessary is just to form an organic thin film EL element two-dimensional on the same translucency substrate 1, as shown in drawing 3 , in constituting a thin shape display panel using the organic thin film EL element of drawing 2 . Thus, by constituting, a display becomes possible by high contrast about a character or a picture. It is desirable in that case to form the tooth-back black film 12 in the internal surface or outside surface of the closure board 8, and to prevent outdoor daylight reflection further.

[0052] Next, the inorganic thin film type EL element of a direct-current drive of the field luminescence type which replaced with the organic luminous layer of drawing 1 , and used the inorganic semiconductor thin film as an inorganic luminous layer is explained. Drawing 4 is the cross section of such an inorganic thin film type EL element, and this element has the same composition as drawing 1 except using an inorganic semiconductor thin film as a luminous layer. Thus, by constituting a back plate 4 like the case of drawing 1 , the outdoor daylight reflection factor of a back plate 4 is reduced, and formation of the picture of high contrast is attained. Inorganic semiconductor thin film (inorganic luminous layer) 3i which consists of alpha-p type SiC layer 3a, alpha-i type SiC layer 3b, and alpha-n type SiC layer 3c can be used for such a direct-current drive type inorganic thin film EL element. In this case, the material explained in drawing 1 as extinction nature electrode layer 4a can be used, for example, Mg:MgO and aluminum:aluminum 2O3 can be used. Moreover, since the thermal resistance of inorganic luminous layer 3i is high, it is also possible to use what formed the black metal carbide thin film by methods, such as a spatter and electron beam evaporation, by conductivity, such as TaC. The material explained [in / drawing 1 / as electric conduction auxiliary-electrode layer 4b] can be used, for example, aluminum can be used.

[0053] In addition, the back plate 4 which has the electron-injection layer which is equivalent to electron-injection low work function layer 4c as shown in drawing 2 as a back plate 4 of the EL element of drawing 4 can also be formed. In this case, metal silicide, such as aluminum silicide, can be used as an electron-injection layer.

[0054] Next, the inorganic alternating current drive type thin film type EL element which has the inorganic luminous layer which consists of an inorganic fluorescent substance is explained. Drawing 5 is the cross section of such an EL element, and this element has the same composition as drawing 4 except having used inorganic luminous layer 3i which consists of inorganic fluorescent substances, such as ZnS and CaS, as a luminous layer, and having pinched the inorganic luminous layer 3i by the insulating layers 13, such as SiO2 and Ta 2O5. Thus, by constituting a back plate 4 like the case of drawing 4 , the outdoor daylight reflection factor of a back plate 4 is reduced, and formation of the picture of high contrast is attained. In this case, as extinction nature electrode layer 4a, In:In 2O3 or Cr:CrO can be used. Moreover, since the thermal resistance of inorganic luminous layer 3i is high, it is also possible to use what formed the black metal carbide thin film by methods, such as a spatter and electron beam evaporation, by conductivity, such as TaC. The material explained [in / drawing 1 / as electric conduction auxiliary-electrode layer 4b] can be used, for example, aluminum can be used.

[0055] The thin film type EL element of this invention is producible by choosing a suitable method according to membrane formation material from a well-known method, for example, a vacuum deposition method, a spatter, an electron-beam-evaporation method, etc.

[0056]

[Function] In the thin film type EL element of this invention, a back plate is constituted from an extinction nature electrode layer and an electric conduction auxiliary-electrode layer, and the extinction nature electrode is arranged to a luminous layer side. Therefore, the outdoor daylight which carried out incidence to the interior of an element from the translucency electrode is

absorbed by the extinction nature electrode layer. Therefore, it becomes possible to reduce the reflection factor of the outdoor daylight in a back plate. And since a back plate has a conductive auxiliary layer, it becomes possible [holding the electric resistance of the back plate itself to a low value].

[0057]

[Example] Taking the case of the element of the mode of drawing 2 , the following examples explain concretely the thin film type EL element of this invention.

[0058] On the blue sheet glass substrate 1 with an example [1] and an example of comparison 1 thickness of 1.1mm, the translucency electrode 2 as an anode plate was formed by forming 120nm ITO by the spatter.

[0059] Next, after rinsing the glass substrate 1 with which this translucency electrode 2 was formed, plasma washing of it was carried out. Then, by carrying out the vacuum evaporationo of the TPD by 65nm **, the hole-injection transporting bed 5 was formed and luminous layer 3o was formed by carrying out the vacuum evaporationo of the Alq by 65nm ** on it further.

[0060] In the case of the example 1, electron-injection low work function layer 4c was formed on this luminous layer 3o by forming an Mg:Ag alloy (evaporation-rate ratio 10:1) by about 9nm ** by vapor codeposition. Next, in order to form extinction nature electrode layer 4a on the electron-injection low work function layer 4c, In was used as an evaporation source, membranes were formed the speed for about 5nm/under the oxygen atmosphere of abbreviation 5x10-4Torr, and the black indium oxide film was formed by conductivity to about 135nm ** equivalent to one half of the thickness of the luminescence dominant wavelength of a luminous layer. Furthermore, on it, by carrying out the vacuum evaporationo of the MgAg alloy by 180nm ** by 2x10-5Torr, electric conduction auxiliary-electrode layer 4b was formed, and this formed the back plate 4 of 3 lamination as cathode.

[0061] Next, as a closure layer 6, on the back plate 4, vacuum evaporationo was carried out the speed for 30nm/, the MgO film of 300nm ** was formed, and the glass plate was further pasted up as a closure board 8 under the oxygen atmosphere of 5x10-4Torr by making Mg into an evaporation source by the ultraviolet-rays hardening resin used as the adhesion material layer 7. This obtained the thin film type EL element (example 1) of drawing 2 .

[0062] On the other hand, the thin film type EL element of the example 1 of comparison was obtained like the example 1 except using the MgAg alloy monolayer of about 200nm ** as a back plate.

[0063] The element of the acquired example 1 carried out yellowish green luminescence by the brightness of 5208 cd/m2 by 16V direct-current-voltage impression. The current density at that time was 266 mA/cm2.

[0064] Moreover, when aluminum surface coated mirror was made into 100% and the outdoor daylight reflection factor on the back plate of the EL element of an example 1 was measured with the incident angle of 5 times using Shimazu UV-160 spectrophotometer, the value of 12% (420nm), 37% (520nm of EL peak wavelength), and 26% (620nm) was shown.

[0065] On the other hand, when measured like [reflection factor / outdoor daylight / on the back plate of the EL element of the example 1 of comparison] the case of an example 1, the example about 3 times the reflection factor of one was shown.

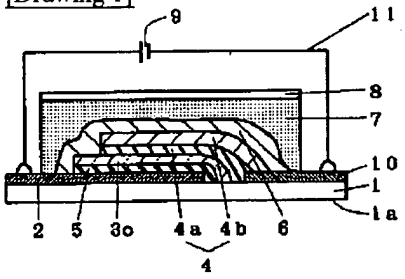
[0066]

[Effect of the Invention] According to the thin film type EL element of this invention, the outdoor daylight reflection factor in a back plate can be reduced, and a luminescence display will be a legible EL element also in the bright room.

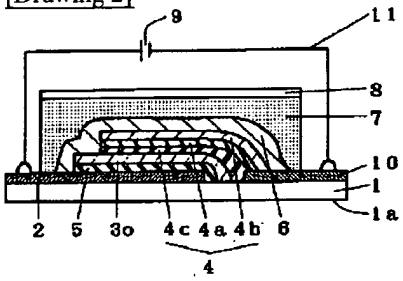
[Translation done.]

DRAWINGS

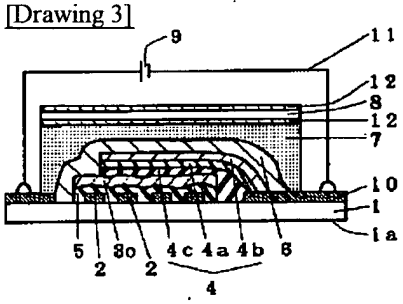
[Drawing 1]



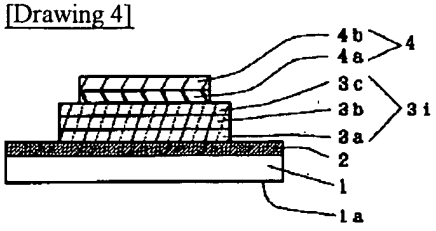
[Drawing 2]



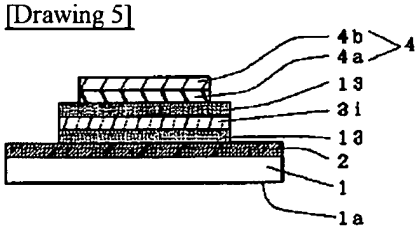
[Drawing 3]



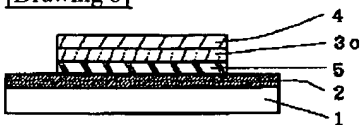
[Drawing 4]



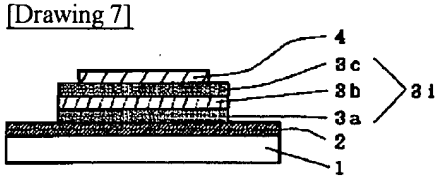
[Drawing 5]



[Drawing 6]



[Drawing 7]



[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the cross section of the thin film type EL element of this invention which uses an organic luminous layer.
[Drawing 2] It is the cross section of the thin film type EL element of this invention which uses an organic luminous layer.
[Drawing 3] It is the cross section of the thin shape display using the thin film type EL element of this invention.
[Drawing 4] It is the cross section of the direct-current drive type inorganic thin film type EL element of this invention which uses an inorganic semiconductor thin film as a luminous layer.
[Drawing 5] It is the cross section of the alternating current drive type inorganic thin film type EL element of this invention which uses an inorganic fluorescent substance as a luminous layer.
[Drawing 6] It is the cross section of the conventional thin film type EL element which uses an organic luminous layer.
[Drawing 7] It is the cross section of the conventional inorganic thin film type EL element which has the luminous layer which consists of an inorganic semiconductor thin film.
[Description of Notations]
1 Translucency Substrate
2 Translucency Electrode
3 Luminous Layer
3o An organic luminous layer
3i An inorganic luminous layer
4 Back Plate
4a Extinction nature electrode layer
4b Electric conduction auxiliary-electrode layer
4c Electron-injection low work function layer

[Translation done.]